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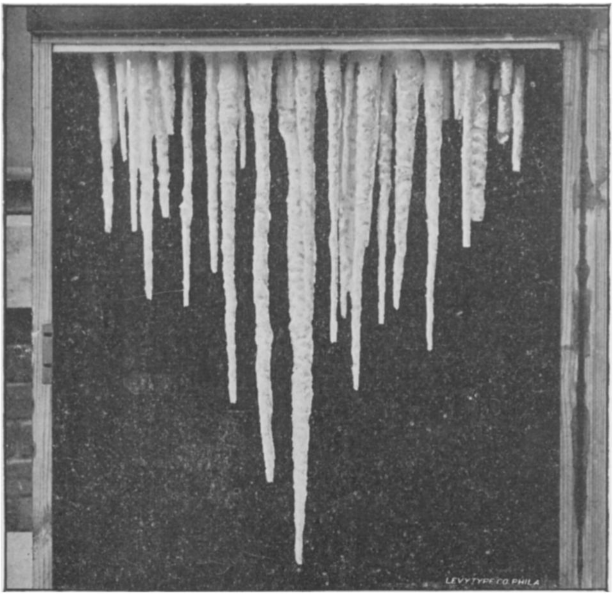
PLATE XXXIV.



From photograph of Stalactite 60 centimeters long and 20 years old; formed between the years 1873 and 1893 on the ceiling of a reservoir roof arch at Bayreuth, Bavaria. Scale $\frac{1}{7 \cdot 78}$

ARCHEOLOGY AND ETHNOLOGY.[1]

The Age of Certain Stalactites.[2]—The fact has been recognized for some time among scientists that the formation of stalactites, under favorable circumstances may take place in a relatively short time.

Nevertheless, observations upon the exact period required for the growth of given examples have been rather rare, for while there has been abundant opportunity to compute the age of stalactites at railway bridges and tunnels, the various dangers which beset these delicate growths in such places have generally put a considerable limit to their age, and deprived them of conspicuous size. It may, therefore, be of interest to state an instance where not only the time of growth but also the exact size of a stalactite can be given with absolute precision.

In the year 1873 the city of Bayreuth (Bavaria) built a reservoir for drinking water three kilometers southwest of the town. This so-called Lasser Reservoir is built in a *Keupersand* soil which contains exceedingly slight traces of lime. The water used in the basin comes out of the *Keuper*, (the uppermost of the three subdivisions of the Triassic period), and likewise contains lime, though in very small quantity. At the point shown in the illustration a spot on the ceiling of the arch (built across the tank to protect the water from pollution H. C. M.) stalactites of remarkable size had formed in 1893. Supposing that they had begun to form by the infiltration of surface water through the arch immediately upon its completion in 1873, they could not have been more than twenty years (1873–1893) old, and as the photograph recently taken from nature shows their length to be between 60 and 80 centimeters, they must have grown on an average of from 3 to 4 centimeters a year. The reservoir was first used in 1874, the tank under the arch remaining full of water until the present year, when in the course of the summer, the water was drawn off for repairs, and an opportunity afforded of observing and detaching some of the stalactites. A great number of the finest specimens were broken through the ignorance of workmen. In a damp walled chamber adjacent to, though not included in the area of, the basin, hung whole rows of stalactites from 20 to 30 centimeters long. These were extremely fragile and very difficult to remove without breaking.

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[1] This department is edited by H. C. Mercer, University of Pennsylvania.

[2] Translation from the original German.

A careful examination of the structure of the reservoir building showed that the stalactites must have formed as follows:

The reservoir's arched roof from which they hung was built of bricks laid in cement (probably the kind known in America as German Portland, H. C. M.). Slight fissures had formed in the cement through which the water of the surface (rain water H. C. M.) had trickled. This down trickling water had dissolved portions of the cement, and then evaporating, had first caused a formation composed of particles of lime dissolved from the cement. This formation was the starting point of the stalactites. On it had been precipitated very fine particles of the reservoir water, leaving after they had evaporated a further residuum of lime upon the already existent pendant.

This view is strengthened by the fact, that since the building of another more recent (so-called Fuchstein) reservoir 3 kilometers west of Bayreuth, stalactites 2.5 centimeters long have shown themselves hanging in the same way from the cement ceiling of the roofing arch. Moreover, if indentations are scratched in the cement, pendent accumulations of lime are soon formed, which, however, are not hollow in the middle like the stalactites.

Finally, as the result of an experiment, the following method for producing stalactites artificially, may be mentioned:

Take a common hectoliter cask. Make a hole in its bottom. Plug this hole with a wooden plug so wound with tow that the water may trickle through it in very small quantities. Around the end of the plug on the outside of the bottom of the cask, spread cement (German Portland cement, H. C. M.) in which a slight fissure should be left. Then fill the cask with the water containing lime in solution and place it in the open air. Hang a piece of tow on the fissure in the cement so that the water trickles upon it, and stalactites will form very rapidly. In this way I made a stalactite 5 centimeters long inside of 8 weeks.

FRANZ ADAMI.

Bayreuth, September 30, 1894.

Note by the Editor.—A very hard crust of stalagmite, covering a loam bed with rhinoceros teeth and human relics, overlaid the cave floor of Kents Hole (near Torquay, England) in which Mr. McEnery says (1825) that he found in no instance breaches or openings, " but one continuous plate of stalagmite diffused uniformly over the loam." Schmerling who (in 1832) used to climb down into Engis Cave (near Liege, Belgium) by a rope tied to a tree, and after a long crawl, stand in the mud to superintend by torchlight, workmen digging in a wet hole, had to break through a stalagmitic floor hard as marble and cut five feet into a breccia nearly as hard, to find the famous skull now in the University of Liege.

But the presence of these crusts, though serving satisfactorily to separate diverse accumulations on cave floors one from another, is no longer regarded in Europe as evidence of the great age of relics so entombed.

In the Wyandot Cave (right bank of Blue River, 5 miles from its mouth in the Ohio, Crawford Co., Indiana) a hole has been artificially battered in the side of one of the innermost large stalactites called "The Pillar of the Constitution,"and it appeared from the observations of Professor Collet (Ind. Geolog. Survey, 1876–77–78, p. 467) and Mr. Hovey who found (as I did in June, 1894) granite pebble hammerstones lying in a mass of splinters near the hole, and Mr. H. W. Rothrock, who (in 1877–78) found besides hammerstones, a deer horn "pick" or prying tool, close by, that Indians had battered out the hole with the stone hammers to get fragments of carbonate of lime for some purpose (possibly trinket making) not yet determined.

A crust of stalactite 10 inches thick has since crept over the bruised edge of this unique quarry, and Mr. Hovey thought (Celebrated American Caverns, p. 139) that "at the known rate of increase, it must have required 1000 years for the wrapping to attain its present thickness of 10 inches, and that length of time has, therefore, elapsed since this 'alabaster' quarry was worked."

Professor Adami's above statement which omits, however, a chemical analysis of the cement referred to, is one of the sort of valuable observations which has shaken faith in the worth of all age tests based on stalagmite or stalactite. If for a thousand years the still standing forests have helped dampen the roof of Wyandot Cave, if rain has kept falling at an equal rate all that while, and if water always equally charged with lime has gone on trickling through the ceilings ever since, then what happened in twenty years to rain water and cement at Bayreuth might have taken fifty or a hundred times as long to happen to rain water and limestone in Indiana. But we can hardly imagine a case where in a cave care enough would have been taken, and time enough spent in measuring the yearly increment, or still more where the inferred conditions of uniformity reaching back into a little known geological past, could have been weighed.

H. C. Mercer.

Indians Mining Lead.—Mr. Benjamin Pursell, of Kintnersville, Bucks County, Pa., told me in September, 1891, as a well known story in the Delaware Valley, that Indians in the last century had shown members of the Ridge family, then living on Ridge's Island, lead ore in situ, at a spot never since discovered in the neighboring hills.

More definite still is the lead story of New Galena, Bucks County, Pa., at third hand. Somewhere in the middle of the century Elijah and Abraham Campbell, of Plumstead, told John M. Proctor, now of Blooming Glen, who wrote me in December, 1891, that straggling Indians coming to hunt along the north branch of the Neshaminy, between 1790 and 1808, had often taken them as boys to a place near the mouth of the "Hartyhickon" (now the property of Mr. Arthur Chapman). There they disappeared in the woods to return with their arms full of lead, with which they made bullets.

I took these for local tales till I was surprised to hear J. M. Kessler, at Hummel's Wharf, Snyder County, Pa., tell me the same story, while pointing to the hills across the Susquehanna as its scene. But I came nearest of all to the legend when Reuben Anders, of Little Wapwalopen, Luzerne County, Pa., gave me it first hand. He had seen the Indian who had spent the night with his grandfather and offered to show him a mineral wonder on a hill called Councilkopf. Though the latter was afraid to follow the red man alone, one Harman had gone hunting with two others, who when bullets had given out had gone into the woods and returned with loads of lead. If untrue, it is hard to see why this lead story has so seized the popular mind. But when we realize, as I am informed, that lead rarely, if ever, occurs pure in nature, but as galena, which, if mixed with lumps of limestone, requires about 1200 degrees (Centigrade) of heat to smelt by drying out the carbonic acid and removing the sulphur, it is to be doubted whether, given the galena, any such offhand bullet-making in the woods could ever have taken place.[3]

Squier and Davis found galena ornaments in ancient Ohio tumuli. Mr. Clarence B. Moore showed me a lump excavated by him from a St. John's River (Florida) mound, and modern Sioux ornament their catlinite pipes with lead, but no digging has yet proved that mound builder or Indian in pre-Columbian times regarded galena as other than a hard, glittering stone to be pounded or rubbed into trinkets.[4]

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[3] Some specimens of galena, recently obtained through Mr. Alfred Paschall, from the prospective mine now working in the bed of the North Branch of the Neshaminy, on the farm of Henry Funk (New Britain Township, Bucks County, Pa.), would not melt in a red-hot crucible, but splintered into fine fragments, as did other fragments when held directly in the bellows fire.

Still we know that the Rhode Island Indians very soon learned the art of pewter casting from Roger Williams' colonists, and the question therefore, is, had Indians in Eastern Pennsylvania by 1780–90 learned from white men how to smelt bullets from galena for their newly acquired guns?

Whether or not these lead tales furnish us with an archeological clue of importance, they seem less strange than the story told me on July 12, 1893, by Charles Keller (now 84 years old), of Point Pleasant, Bucks County, Pa., as related to him sixty years ago by his father, Christopher Keller. About the end of the last century Peter Keller, Christopher's brother, had refused to do some iron work for a band of Indians at his blacksmith shop, on Tohickon Creek, above Stover's mill (the present Redding Meyers farm,) about six miles above its mouth on the Delaware River. When he pleaded as an excuse that his supply of charcoal was exhausted, the Indians went into the forest and after nearly a day's absence returned with a basket full of "stone" (anthracite) coal, with which he did the job.

H. C. Mercer.

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[4] After the present pages were written, Mr. Walter Chase, of Madison, Wisconsin, showed me a small figure of a turtle of cast lead found by him at a surface Indian camp site in 1889 on the shore of Lake Wingra, two miles southwest of Madison. Dr. Hall, of Madison, had another plowed up by a farmer in 1891, with a stone axe and four or five arrowheads, from an effigy mound shaped, itself, somewhat like a turtle, on the shore of Lake Mendota, near Madison. Two perforated discs of cast lead have also been found by farmers in Dare County, Wisconsin, and are now in the possession of neighboring collectors. Galena occurs in Southern Wisconsin in small, loose masses in a very pure state.